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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte RICHARD D. DETTINGER, JUDY I. DJUGASH,
JOEL C. DUBBELS, and RICHARD J. STEVENS

Appeal 2009-002095
Application 10/821,228[1]
Technology Center 2100

Decided: November 23, 2009

Before LEE E. BARRETT, JOSEPH L. DIXON, and THU A. DANG, *Administrative Patent Judges*.

BARRETT, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134(a) from the final rejection of claims 1-44. We have jurisdiction pursuant to 35 U.S.C. § 6(b).

We reverse.

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[1] Filed April 8, 2004, titled "Method and System for Relationship Building from XML." The real party in interest is International Business Machines Corporation.

STATEMENT OF THE CASE

The invention

The invention generally relates to relationship building from XML (eXtensible Markup Language) and, more particularly, to extracting relationships from XML documents and creating corresponding relationships for a relational database. Spec. ¶ [0002].[2] In general, the invention relates to representing relationships from a first physical representation of data in a data abstraction model that describes an abstract view of a second physical representation of the data. Spec. ¶ [0027]. In one embodiment, the first physical representation of the data is a document in text-based markup language, such as an XML document, and the second physical representation of the data is a relational database schema. *Id.*

A data structure is a physical arrangement of the data, such as an arrangement in the form of a database table or a column of the database table. In a relational database environment having a multiplicity of database tables, a specific logical representation having specific logical fields can be provided for each database table. In this case, all specific logical representations together constitute the data abstraction model. Physical entities of the data are arranged in the database according to a physical representation of the data. A physical entity of data is a data item in an underlying physical representation. Accordingly, a physical data entity is the data included in a database table or in a column of the database table, i.e., the data itself. Spec. ¶ [0044].

[2] Paragraph numbers refer to numbers in the Specification as filed.

The claims

Illustrative claim 1 is reproduced below:

1. A computer-implemented method of logically representing relationships between data elements defined according to a first physical representation of data, comprising:

providing a logical representation of the data, the logical representation abstractly describing a second physical representation of the data, wherein the second physical representation of the data is generated from the first physical representation of the data;

on the basis of the relationships between the data elements defined according to the first physical representation of the data, determining corresponding relationships between corresponding data structures defined according to the second physical representation of the data;

generating logical relationships abstractly describing the determined corresponding relationships, each logical relationship defining a path between data structures of the second physical representation;

associating the generated logical relationships with the logical representation of the data; and

storing the associations and the generated logical relationships on one or more computer-readable storage media.

The references

Depledge	US 5,899,988	May 4, 1999
Murthy	US 2004/0220927 A1	Nov. 4, 2004 (filed May 1, 2003)

The rejections

Claims 1-3, 5-7, 9-12, 14-16, 18-21, 23-25, 27-30, 32-34, 36-38, 40-42, and 44 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Depledge.

Claims 4, 8, 13, 17, 22, 26, 31, 35, 39, and 43 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Depledge and Murthy.

PRINCIPLES OF LAW

Anticipation

"Anticipation requires the presence in a single prior art disclosure of all elements of a claimed invention arranged as in the claim." *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983).

Obviousness

Obviousness requires that the combination of references teach or suggest to a person of ordinary skill in the art all of the claim limitations. 35 U.S.C. § 103(a).

INITIAL OBSERVATION ON REJECTION

Claims 1, 11, 17, and 18 recite a "computer-implemented method." Claims 19, 29, 35, and 36 recite a "computer-readable medium containing a program which, when executed by a processor performs a process." Claim 44 recites an "article" comprising computer-readable medium containing a data structure having a plurality of logical field specifications, "one or more logical relationships algorithmically generated from

relationship information." The rejections do not address the computer-implemented and algorithmically generated aspect of the claims. For example, the Examiner points to data structures in Figures 1 and 2A of Depledge but does not address how claim limitations, such as "determining corresponding relationships" and "generating logical relationships" in claim 1 are performed by a computer. It is not sufficient that relationships exist when the claims require that they are determined by a computer.

FINDINGS OF FACT -- CONTENT OF DEPLEDGE

Depledge relates to bitmapped indexing. A table data structure 100 having rows and columns is shown in Figure 1. Each of the rows contains a type of customer data (CUSTOMER #, LOCATION, TYPE). Each row contains all of the data for a particular customer. The CUSTOMER # is a unique number, the LOCATION has four possible values (NORTH, SOUTH, EAST, and WEST), and the TYPE has two possible values (BUSINESS and INDIVIDUAL). Col. 2, ll. 24-36.

A bitmapped index for data type LOCATION is shown in Figure 2. Each index entry corresponds to one of the four possible values (key values) for the data type location and includes both the key value and a bitmap. Each bitmap contains a string of bits, with each bit (left to right) corresponding to a specific row (top to bottom) in the LOCATION column of the data table 100. A bit value of "1" indicates that the cell at the intersection of the LOCATION column and the row which corresponds to

that bit corresponds to the key value for that bitmapped index entry, while a "0" indicates that the cell does not contain the key value. Col. 2, ll. 37-49.

Whenever a data table is changed, all bitmapped indexes based upon that data table must be updated to reflect the change to the data table. Col. 3, ll. 20-22. Updating a bitmapped index can require substantial system resources as data has to be read from storage into memory, updated, and written back to storage, especially since data tables may have thousands or hundreds of thousands of rows. Col. 3, ll. 23-45. In addition, the data table must be locked while the bitmapped index entry is being updated, which means that no other users can make changes to the table. Col. 3, ll. 54-64.

Depledge overcomes the problems using "differential entries." Whenever a change is made to a data table, differential entries are generated and stored in the bitmapped index. "Each differential entry specifies a change to bitmap information contained in bitmapped indexes 600, 650 which, when applied to the bitmap information, causes the bitmap information to reflect the change to data table 500." Col. 6, ll. 62-65. The differential entry indicates that a particular bit needs to be "flipped" to reflect the change. Col. 7, ll. 33-53.

ANTICIPATION

Issue 1

Have Appellants shown that the Examiner erred in finding that Depledge describes a computer-implemented method of logically representing relationships between data elements that includes the act of

"providing a logical representation of the data, the logical representation abstractly describing a second physical representation of the data, wherein the second physical representation of the data is generated from the first physical representation of the data," as recited in claim 1 and a similar limitation in claim 11?

Contentions

The Examiner finds that the "first physical representation of data" corresponds to the table 100 in Figure 1, and the "second physical representation of data" corresponds to the bitmapped index 200 in Figure 2A. Final Rej. 2-3. The Examiner also finds that the "Key" column in Figure 2A is a "second physical representation of the data" and the "1's" and "0's" in the "Bitmap" columns in Figure 2A are a "logical representation abstractly describing a second physical representation of the data." *Id.* at 17; Ans. 16. This correspondence is fairly illustrated by Appellants at Br. 18. Thus, the Examiner reads the "second physical representation of the data" on both the bitmapped index 200 and on the "Key" column of index 200.

Appellants argue that the Bitmap and Key columns of Depledge are integral parts of the bitmapped index 200 and cannot properly be considered to constitute two different representations of the same data. Br. 18. It is argued that "even assuming the index 200, as a whole, maybe considered a representation of data, the constituent parts of the index cannot be understood as *distinct* representations of data." *Id.* at 19.

The Examiner responds that the differential entries to the bitmapped index are a second physical representation which is distinct from the logical representation because they are "stored completely separate in storage and are used to update the logical bitmap representation." Ans. 17.

Appellants reply that even assuming, *arguendo*, that each differential entry is a distinct representation of data, this is irrelevant to the Examiner's rejection which finds the "Key" column and "Bitmap" columns of the same bitmapped index 200 to read on a "second physical representation of data" and a "logical representation of data," respectively. Reply Br. 3.

Appellants argue that first and second "physical representation of data" define a representation of data, not the data itself. Br. 19. It is argued:

> The Examiner's analysis focuses on the actual physical tables and their data, not on data representations of the data (*i.e.* the schemas of the tables and indexes). Further, there is no suggestion that the data structures relied upon by the Examiner are defined according to different schemas. In fact, quite the opposite, the data structures (*i.e.* the table 100 and the index 200) are both tables that conform to a relational database schema.

Id.

Analysis

The Examiner reads the "second physical representation of the data" on both the bitmapped index 200 and on the "Key" column of index 200. This makes the rejection confusing.

We find that the data table 100 is a "first physical representation of data" and the bitmapped index 200 is a "second physical representation of

data, wherein the second physical representation of the data is generated from the first physical representation of the data." The bitmapped index 200 is generated from the data table 100. Appellants' argument that the table 100 and index 200 are not defined according to "different" schema is not persuasive because the representations of data in Depledge are different and claims 1 and 11 do not specify different schema (*compare* claim 18).

The Examiner's reliance of differential entries seemingly has no application to the limitation at issue. The differential entries are part of the bitmapped index as shown in Figure 8 of Depledge and do not define a "logical representation abstractly describing a second physical representation of the data" as claimed.

We agree with Appellants that the "Bitmap" columns cannot reasonably be considered a "logical representation of the data, the logical representation abstractly describing a second physical representation of the data," and the "Key" column to be the "second physical representation," as stated by the Examiner. These columns are integral parts of the bitmapped index 200 as a whole, not separate representations. The "1's" and "0's" in the Bitmap columns physically represent the data in table 100 (i.e., each "1" represents the presence of the Key term in a position in the column of data table 100) and are not a logical representation of the data in the Key column. The Examiner has not established that Depledge describes "providing a logical representation of the data, the logical representation abstractly describing a second physical representation of the data" or that such step is performed by a computer.

Conclusion

Appellants have shown that the Examiner erred in finding that Depledge describes a computer-implemented method of logically representing relationships between data elements that includes the act of "providing a logical representation of the data, the logical representation abstractly describing a second physical representation of the data, wherein the second physical representation of the data is generated from the first physical representation of the data," as recited in claim 1 and a similar limitation in claim 11. Nevertheless, we consider the other arguments.

Issue 2

Have Appellants shown that the Examiner erred in finding that Depledge describes that "on the basis of the relationships between the data elements defined according to the first physical representation of the data, determining corresponding relationships between corresponding data structures defined according to the second physical representation of the data," as recited in claim 1 and a similar limitation in claim 11?

Contentions

Appellants argue that according to the Examiner's analogy of the Bitmap and Key columns as corresponding to the "logical representation of the data" and the "second physical representation of the data," respectively, the limitation at issue would be translated as "on the basis of relationships defined according to Data Table 100 ('first physical representation of data'),

determining corresponding relationships between corresponding data structures defined according to the Key Column ('second physical representation of data') of the Bitmapped Index 200." Br. 19. It is argued that this translated statement makes no sense and "*Depledge* does not disclose any data structures of any sort that are 'defined according to the Key Column.'" *Id.* at 20.

The Examiner finds two relationships in table 100: (1) between the CUSTOMER # and the LOCATION; and (2) between the CUSTOMER # and the TYPE. Final Rej. 2-3. The Examiner finds that the data structures in Figures 1 and 2A of Depledge are tables consisting of rows and columns. It is stated that the "data structure in Figure 2A is defined by the use of bits '1' and '0', which represent the relationship between, in this case, a customer # and a location." *Id.* at 3; Ans. 18.

The Examiner further finds that Depledge describes generating differential entries which are stored within the bitmapped indexes, "[s]o the logical representation clearly contains an intermediate physical representation which constitutes the second physical representation as claimed by Applicant." Ans. 18.

Analysis

It is not clear why the Examiner refers to generating differential entries. A "differential entry specifies a change to bitmap information contained in the bitmapped indexes 600, 650 which, when applied to the bitmap information, causes the bitmap information to reflect the change to

data table 500." Depledge, col. 6, ll. 62-65. Differential entries do not determine "corresponding relationships between corresponding data structures defined according to the second physical representation of the data," or, at least, the Examiner has not explained what in the differential entries constitute the data structures and what constitute the relationships.

We agree with Appellants' understanding of the rejection that the Examiner relies on the data table 100 as the "first physical representation of data" and the Key column of the bitmapped index 200 as the "second physical representation of the data." As previously noted, there is some confusion in the rejection because the Examiner also relies on the whole bitmapped index 200 as the "second physical representation," not just the Key column. However, for the rejection to provide for a "logical representation," something, in this case the Key column, must be the "second physical representation." We agree with the way Appellants have translated the Examiner's findings into the claim language.

There are "relationships" between the data elements in data table 100, which constitutes the first physical representation of the data, as noted by the Examiner. The "1's" and "0's" in the rows of the bitmapped index 200 have a relationship to the key value for the row and express a relationship between the key value and the values in the LOCATION column of data table 100. The rows of the bitmapped index do not expressly contain a relationship to the CUSTOMER #, contrary to the Examiner's statement. Taking the Examiner's interpretation of the Key column as the "second physical representation of the data," the Examiner has not explained what

constitutes "data structures defined according to the second physical representation of data," or how Depledge teaches "relationships between corresponding data structures defined according to the second physical representation of the data." The Examiner has not explained why Appellants are incorrect in arguing that "*Depledge* does not disclose any data structures of any sort that are 'defined according to the Key Column." Br. 20. The Key column is at most one data structure and thus does not allow for "relationships between corresponding data structures." The rejection twists the claim language to fit Depledge in an unnatural way which ultimately results in inconsistencies that cannot be defended.

Conclusion

Appellants have shown that the Examiner erred in finding that Depledge describes that "on the basis of the relationships between the data elements defined according to the first physical representation of the data, determining corresponding relationships between corresponding data structures defined according to the second physical representation of the data," as recited in claim 1 and a similar limitation in claim 11.

Issue 3

Have Appellants shown that the Examiner erred in finding that Depledge "generating logical relationships abstractly describing the determined corresponding relationships, each logical relationship defining a path between data structures of the second physical representation," as recited in claim 1, and similar limitations in claims 11, 19, 29, and 44?

Contentions

The Examiner finds that the "'Bitmap' column describes a 'path' in that each bit corresponds to a customer for a given Location. For example, NORTH would follow a logical path of '0 1 0 0 0 1' in order to determine which customer has a location of NORTH, and so on." Final Rej. 19 (italics omitted).

Appellants argue that under the Examiner's finding that the Key column corresponds to the "second physical representation," the Examiner fails to show a logical relationship defining a path between data structures of the Key columns. Br. 20. "Even if we assume that the data structures are the values of the Key Column (*i.e.* 'NORTH', 'SOUTH', 'EAST', 'WEST'), it makes no sense to define a 'path' between those values." *Id.*

The Examiner states:

> A "Path" given its broadest interpretation in the art is a route through a structured collection of information. Examiner would like to make note that Depledge meets this interpretation in that the "Bitmap" column supplies bits, which define a route in order for a system to logically navigate to the customers which have a location of NORTH. It then uses this path to update the logical bitmap index to reflect changes made to the physically stored second representation of the first representation of changes or data.

Ans. 19.

Appellants reply that "it appears that the Examiner is arguing that the bits read on the recited 'logical relationships defining a path." Reply Br. 3. It is argued that the Examiner fails to address the argument in the main brief

that the Examiner's analogy translates to defining a path between data structures of the Key column. *Id.* It is argued that "[t]he Examiner fails to explain how the 'data structures' of the Key column are represented in this analogy." *Id.* It is argued that "the bits of the 'Bitmap' table do not abstractly describe the 'determined corresponding relationships' recited in the claims.'" *Id.* at 3-4.

Analysis

We agree with Appellants' understanding that the Examiner relies on the Key column of the bitmapped index 200 as the "second physical representation." The limitation at issue is not just "path" but also "generating logical relationships abstractly describing the determined corresponding relationships, each logical relationship defining a path between data structures of the second physical representation." The Examiner has not shown that the Key column contains "data structures," plural, between which there exists a "path." Moreover, we do not agree with the Examiner's finding that the bits in a row of the bitmapped index are a path. The bits in a row are logically combined using AND and OR operations with other rows of bits and are not followed. As Appellants point out, even if the bits in a row are a path, the Examiner has not shown how the bits represent "a path between data structures of the second physical representation." Accordingly, Appellants have shown error in the Examiner's rejection.

Conclusion

Appellants have shown that the Examiner erred in finding that Depledge discloses "generating logical relationships abstractly describing the determined corresponding relationships, each logical relationship defining a path between data structures of the second physical representation," as recited in claim 1, and similar limitations in claims 11, 19, 29, 35, and 44. The rejection of independent claims 1, 11, 19, 29, and 44, and their dependent claims 2, 3, 5-7, 9, 10, 12, 14-16, 20, 21, 23-25, 27, 28, 30, and 32-34 is reversed.

Issue 4

Have Appellants shown that the Examiner erred in finding that Depledge describes a computer-implemented method of querying physical data logically represented by a data abstraction model that includes the act of "receiving an abstract query comprising logical fields and corresponding values, wherein each of the logical fields is defined in the data abstraction model" and "transforming, by operation of a processor, the abstract query into an executable query capable of being executed against the physical data," as recited in claim 18 and similar limitations in claim 36?

Contentions

The Examiner cites to Figure 3 and column 3, lines 4-14, for "receiving an abstract query." Final Rej. 8.

Appellants argue;

> Here, the Examiner asserts that the bitmapped indexes of *Depledge* (*e.g.*, items 200 and 300) teach the recited element of a data abstraction model. However, following the Examiner's analogy, this would require the step of 'receiving an abstract query comprising logical fields,' wherein the logical fields are define in a bitmapped index (*i.e.*, 'data abstraction model'). Applicants submit that the bitmapped indexes of *Depledge* do not define logical fields, or any other type of field.

Br. 21.

The Examiner cites to Figures 1 and 2A and column 3, lines 22-44 for "transforming the abstract query into an executable query." Final Rej. 8. The Examiner states that "once the location was changed, the values were then changed in the physical data using an executable query which flipped the bits representing the new changed values." *Id.*

Appellants argue that "[c]learly, the 'bits' do not constitute an abstract query, a logical query, or any kind of query. Therefore, Applicants submit that 'flipping the bits' does not teach transforming an abstract query into an executable query, but rather teaches transforming bits within the bitmapped index, *i.e.*, the 'data abstraction model' according to the Examiner's analogy." Br. 21-22.

Analysis

We find that Figure 3 of Depledge shows "an abstract query comprising logical fields and corresponding values," where the fields of the query are "TYPE" and "LOCATION," and the corresponding values are "BUSINESS" for the "TYPE" field and "EAST" or "SOUTH" for the "LOCATION" field. This abstract query must be "received."

However, claim 18 also requires "wherein each of the logical fields is defined in the data abstraction model." As noted by Appellants, the Examiner finds the Bitmap columns in the bitmapped index 200 in Figure 2A of Depledge to be the "data abstraction model." For the reasons discussed in connection with Issue 1, the Bitmap columns are part of the "second physical representation of the data" and do not define a separate "logical relationship abstractly describing a second physical representation of the data." Thus, we agree with Appellants that "the bitmapped indexes of *Depledge* do not define logical fields, or any other type of field," Br. 21, and that Appellants have shown that the Examiner erred in finding that Depledge teaches the limitations "wherein each of the logical fields is defined in the data abstraction model."

As to the limitation "transforming, by operation of a processor, the abstract query into an executable query capable of being executed against the physical data," we agree with Appellants that flipping the bits during execution of the query processing does not teach "transforming . . . the abstract query into an executable query" as found by the Examiner. In addition, it is not clear how Depledge meets the limitation of "transforming,

by operation of a processor, the abstract query into an executable query capable of being executed against the physical data" because no "executable query" is formed that is then "executed against the physical data." Instead, the bitmap row for a Key term is the actual physical data. Therefore, it is not explained how Depledge meets the "transforming" limitation.

Conclusion

Appellants have shown that the Examiner erred in finding that Depledge describes "receiving an abstract query comprising logical fields and corresponding values, wherein each of the logical fields is defined in the data abstraction model" and "transforming, by operation of a processor, the abstract query into an executable query capable of being executed against the physical data," as recited in claim 18 and similar limitations in claim 36. The rejection of independent claims 18 and 36 and their dependent claims 37, 38, and 40-42 is reversed.

OBVIOUSNESS

The Examiner finds that Depledge does not teach use of an XML document instead of a text-based document but finds that Murthy teaches retaining hierarchical information from XML documents. The Examiner concludes that it would have been obvious to use XML documents in Depledge given the teachings of Murthy.

Appellants do not argue the obviousness rejection, but rely on the argument that Depledge does not teach the limitations argued in the anticipation rejection. Br. 22; Reply Br. 4.

The Examiner does not rely on Murthy for the limitations found to be missing in independent claims 1, 11, 19, 29, and 36. Accordingly, the rejection of dependent claims 4, 8, 13, 22, 26, 31, 39, and 43 is reversed.

Independent claims 17 and 35 recite limitations of a "logical representation" and logical relationships "wherein each of the generated logical relationships describes a path for traversing a relational database." We have found that Depledge does not describe a "logical representation," as discussed in Issue 1, or describing a "path" for traversing data structures, as discussed in Issue 3. Murthy has not been relied on for these features. Accordingly, the rejection of claims 17 and 35 is also reversed.

CONCLUSION

The rejection of claims 1-3, 5-7, 9-12, 14-16, 18-21, 23-25, 27-30, 32-34, 36-38, 40-42, and 44 under 35 U.S.C. § 102(b) is reversed.

The rejection of claims 4, 8, 13, 17, 22, 26, 31, 35, 39, and 43 under 35 U.S.C. § 103(a) is reversed.

REVERSED

peb/nhl

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